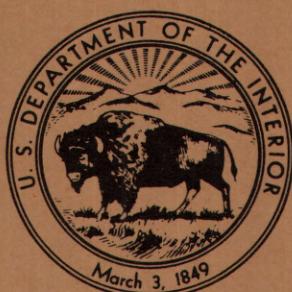


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Rainfall-Runoff Data for Selected Basins, Portland Oregon, and Vancouver, Washington, 1973-77

U.S. GEOLOGICAL SURVEY
Open-File Report 78-291



Prepared in cooperation with the
U.S. Army Corps of Engineers,
City of Portland, Multnomah County, Oregon
and Clark County, Washington

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PORTLAND, OREGON, AND VANCOUVER, WASHINGTON, 1973-77**

By Antonius Laenen and Gary L. Solin

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OREGON and CLARK COUNTY, WASHINGTON**



1978

UNITED STATES DEPARTMENT OF THE INTERIOR
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CONVERSION FACTORS

The following factors may be used to convert English units published herein to the International System of Units (SI). In the text, the metric equivalents are shown only to the number of significant figures consistent with the values for the English units.

Multiply	By	To obtain
inches (in)	25.4	millimeters (mm)
feet (ft)	.3048	meters (m)
miles (mi)	1.609	kilometers (km)
square feet (ft^2)	.0929	square meters (m^2)
square miles (mi^2)	2.590	square kilometers (km^2)
feet per mile (ft/mi)	.1894	meters per kilometer (m/km)
cubic feet per second (ft^3/s)	28.32	cubic meters per second (m^3/s)



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ABSTRACT

In the Portland-Vancouver area, storms and floods are presently being studied in 16 basins with drainage areas ranging from 0.21 to 6.63 square miles (0.54 to 17.2 square kilometers) and with various basin slopes, degrees of imperviousness, and mixes of land use. Fanno Creek basin in Portland has the longest period of rainfall-runoff record, starting in 1973; Tryon Creek basin in Portland is next with a record starting in 1974. Records in all other basins began in 1975. For each basin, data are tabulated for daily precipitation on a yearly basis and for 5-minute precipitation and 5-minute streamflow for selected storms.

INTRODUCTION

Metropolitan Portland and Vancouver are in a period of rapid growth. Because the effects of urbanization on flood peaks are not accurately known in this area, local designers and planners have expressed a need for adequate flood-peak information. The U.S. Geological Survey, in cooperation with the city of Portland, Clark County, Multnomah County, and the U.S. Army Corps of Engineers, is collecting rainfall and runoff information in the Portland-Vancouver area. This information will ultimately be used to develop a method by which magnitudes and volumes of floods can be estimated for any specified recurrence interval for any basin in the study area. This report supplies cooperators and other interested designers and planners with the hydrologic data collected to date. The Geological Survey will continue collecting data until 1979, when an interpretive report will be written.

The locations of the 16 basins under study are shown in figure 1. An eight-digit number identifies each gaging station. Included on the map is the Johnson Creek gage (14211500), which has been monitored by the Survey since 1940 and will be used in the 1979 analysis. Also, the Saltzman Creek gage



Figure 1.—Location of streamflow stations and rain gages.

(14211800), currently in one of the 16 selected rainfall-runoff basins, has been a crest-gage station since 1951. Rainfall and runoff data have been collected at the Fanno Creek gage (14206900) since 1973, the Tryon Creek gage (14211301) since 1974, and all others since 1975.

SELECTED BASIN CHARACTERISTICS

The following are definitions of basin characteristics used to describe the basins listed in table 1:

Drainage area.--Area of the basin, planimetered from U.S. Geological Survey $7\frac{1}{2}$ -minute topographic series maps. Basin boundaries were delineated by outlining drainage divides and then adjusting the natural drainage area on the basis of current storm-sewer information obtained from city and county agencies. A field determination was made at boundaries where drainage area divides could not be determined from the maps.

Effective drainage area.--Drainage area of basin minus that area served by combined sewers and that area in topographic depressions.

Direct runoff is that component of streamflow occurring from overland flow. The areas subtracted do not contribute to this flow component.

Mapped impervious area.--Drainage area impervious to the infiltration of rain, including such areas as paved roads, paved parking lots, roofs, driveways, and sidewalks. Impervious area was taken from map work by both the Columbia Region Association of Governments (CRAG) and the Geological Survey. CRAG mapping was on 1 in=600 ft (25 mm=72 m) black-and-white 1974 aerial photography.

Effective impervious area.--That part of the effective drainage area having a direct hydraulic link to the stream and impervious to the infiltration of rain. In many areas in and around Portland and Vancouver, runoff from roofs either partially or totally drains into dry wells or discharges directly onto lawns. In some basins, entire sewerized areas are "dry-welled." The areas contributing runoff to dry wells in a drainage basin are difficult to determine. One way to estimate effective impervious area is by using the optimal fitting techniques within the Geological Survey's rainfall-runoff calibration model. Although this technique optimizes many of the basin characteristics, including the impervious area, it still yields a reasonable estimate of the effective impervious area.

Because the effective impervious area can be considerably different from that which can be mapped, anyone interested in defining impervious areas in ungaged basins should first try to determine the hydraulic connections between the impervious areas and the stream, and then evaluate their effectiveness.

Land-use types.--Land uses in types I through VI, as mapped by CRAG and the Geological Survey, and as defined as follows:

- I. Parks, forests, vacant lots.
- II. Agriculture.
- III. Light-to-normal residential.
- IV. Dense residential.
- V. Apartments, commercial areas with some lawns, and industrial areas with gravel lots.
- VI. Downtown business, shopping centers, and industrial area with paved lots.

Basin slope.--The average slope for the basin, computed from Survey topographic maps, using the formula described by Wisler and Brater (1959):

$$S = \frac{DL}{A}$$

where D = contour interval, in feet,
 L = total length of contours, in miles, and
 A = drainage area, in square miles.

The relation of basin slope to main channel slope differs considerably between basins in the project area, probably reflecting basin terrain characteristics. For instance, the Willamette River tributary at Oak Grove has a channel that closely follows the general level of the basin terrain, hence the basin slope is not much greater than the main channel slope. The two slope characteristics for Saltzman Creek also are comparable, because both the basin terrain and the channel are quite steep. Characteristics are quite different, however, for Kellogg Creek where the stream lies in a low-gradient valley with steep side slopes. Johnson Creek has similar characteristics and thus a considerably greater basin slope than channel slope.

Main channel length.--The main channel length for the basin, as determined from Geological Survey maps. It is defined as the distance from the gaged site upstream to the watershed divide along the most well-defined and longest channel.

Main channel slope.--The main channel slope for the basin as determined from topographic maps. It is defined as the difference in elevation, in feet, at points 10 percent and 85 percent of the distance along the main channel (see main channel length) divided by the distance, in miles, along the channel between the two points.

Approximate average lag time.--Time from the center of mass of rainfall to the center of mass of runoff, as defined by the Geological Survey rainfall-runoff calibration program. This is an average value based on data from several storms.

Hydrologic soil group.--Soil group types A through D, as mapped by the U.S. Soil Conservation Service in their county soil surveys (1975) and unpublished soil maps and defined below:

- A. (Low runoff potential). Soils having a high infiltration rate even when thoroughly wetted and consisting chiefly of deep, well-drained to excessively drained sand or gravel.
- B. Soils having a moderate infiltration rate when thoroughly wetted and consisting chiefly of moderately deep to deep, moderately well to well-drained soils with moderately fine to moderately coarse texture.
- C. Soils having a slow infiltration rate when thoroughly wetted and consisting chiefly of soils with a layer that impedes downward movement of water, or soils with moderately fine to fine texture.
- D. (High runoff potential). Soils having a very slow infiltration rate when thoroughly wetted and consisting chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a claypan or clay layer at or near the surface, and shallow soils over nearly impervious material.

DATA COLLECTION AND STORAGE

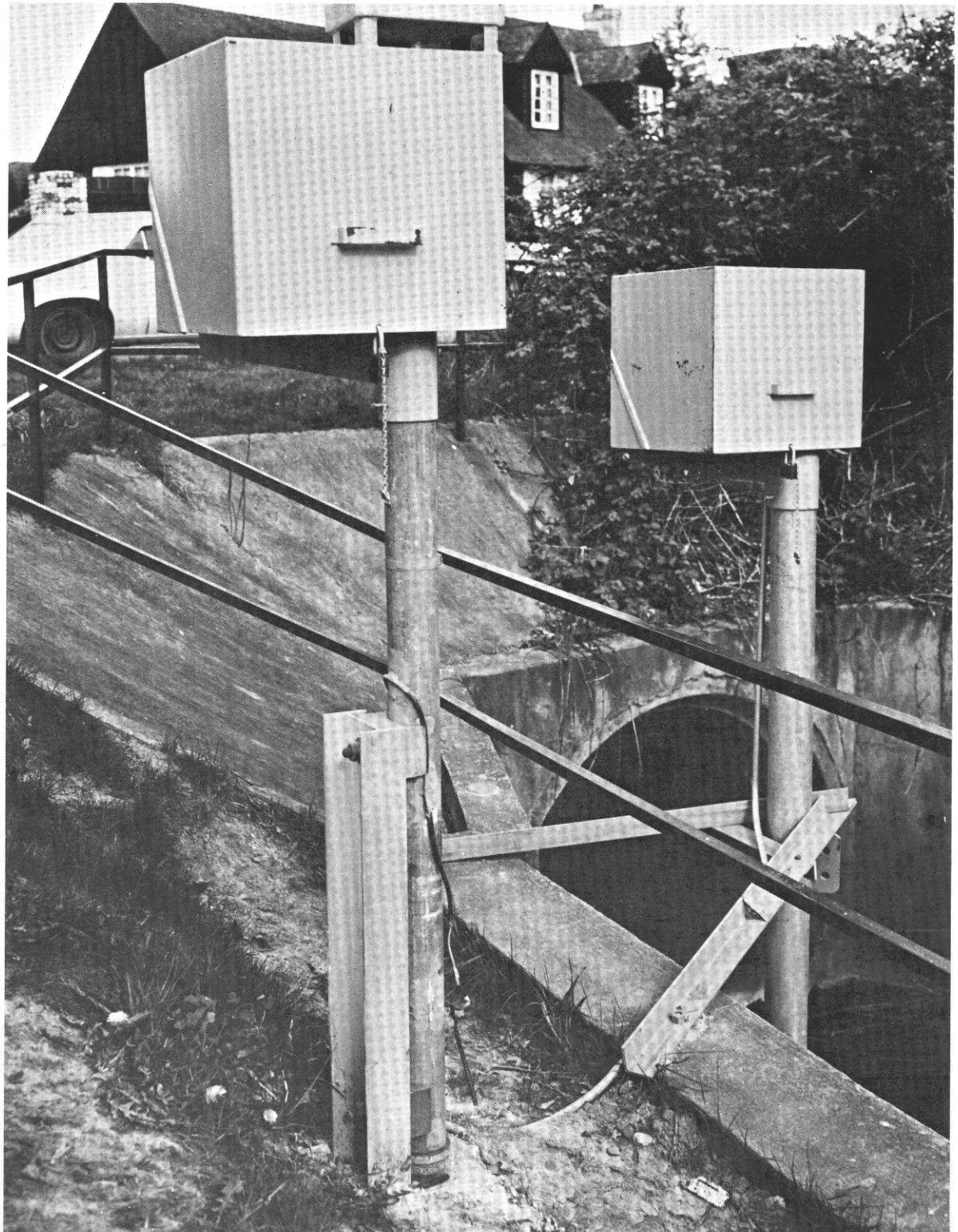
One objective of this study is to collect enough storm data (approximately 20 storms per site) to calibrate a rainfall-runoff model for each of the 16 basins. In addition to the basins where the Geological Survey collected data, several of the sewer basins for which the city of Portland measured storm runoff will be modeled. A method then will be developed to estimate magnitudes and volumes of peak flows for specific recurrence intervals for any basin in the Portland-Vancouver area. All Geological Survey storm data and some of the city's storm data will be stored in the Geological Survey's computer system in Reston, Va.

Instrumentation

Generally, rainfall and streamflow data were collected at a basin's outflow, using automatic digital recorders (ADR's) in dual operation, as shown in figure 2. If a basin was larger than 2 mi^2 (5.18 km^2), one or more additional rain gages were established to better define the rainfall distribution. Locations of stream-gaging stations and rain gages are shown in figure 1, and the rainfall and storm-runoff data are listed in tables 3 and 4 at the end of the report.

Rain Gages

The rain gages used operate on the following principle: Rain is funneled into a 3-in (76-mm) ID collector pipe. A wire attached to a float translates the elevation of the water surface in the pipe to an ADR. The recorder float wheel is calibrated to the size of the collector funnel and to the pipe diameter. When the water surface reaches a maximum level in the



City of Portland photo

Figure 2.—Typical rainfall-runoff gage installation.

collector pipe, an automatic siphon action occurs, emptying the collector pipe and lasting generally less than 5 minutes.

The pipe collects approximately 4 in (102 mm) of rainfall between siphon events. A 16-channel paper tape is punched, recording the volume of rainfall to the nearest hundredth of an inch for a 5-minute interval. In dual operation, a single timer activates both the rain-gage and stream-gage recorders, and one battery serves as the power supply.

Stream Gages

A 4-in (102 mm) ID pipe with holes in the bottom cap (arranged so that velocities do not affect the inside water surface) acts as a stilling well. A wire attached to a float and counterweight translates water-surface elevations to the recorder. A paper tape is punched at 5-minute intervals, recording the stage of the stream. Most stream gages are located at the pool above a control with a stage-discharge relation or rating that can be theoretically computed. Most gages have stable culvert controls. Check measurements have been made by current meter and constant-rate dye-injection methods to verify all stage-discharge ratings at culverts. Where stable controls were not available or theoretically were not ratable, measurements were made on a monthly basis, and ratings were developed from these measurements.

Data Storage

All paper tapes are processed through the Geological Survey computer terminal in Portland, Oreg., and pertinent data are stored in the computer system in Reston, Va. The data stored are as follows: (1) daily precipitation data shown in table 3 by station number order; (2) daily precipitation at the Customs House, Portland, Oreg., 1872 to 1973; (3) daily evapotranspiration at the North Willamette Experimental Station at Canby, Oreg., from 1962 to present; (4) complete storm data of rainfall and streamflow (at 5-minute intervals) for those storms shown in table 4; and (5) rainfall data (at 5-minute intervals) for approximately five storms per year at the Customs House in Portland, Oreg., for the period 1903-73.

BRIEF ASSESSMENT OF HISTORICAL RAINFALL DATA

Short-duration rainfall intensities in the Portland area are not nearly so extreme as in many parts of the country, but daily rainfall extremes are comparable (U.S. Weather Bur., 1963). A common occurrence in the Portland area is nearly continual rainfall persisting for several days, which likely influences the magnitude of storm-runoff peaks.

Data obtained from the U.S. National Oceanic and Atmospheric Administration's National Climatic Center and collected at the Customs House in Portland (a first-order weather station), show the following: Only four times in 80 years has the 5-minute precipitation exceeded 0.3 in (7.62 mm); only twice in 80 years has the hourly precipitation exceeded 1.0 in (25.4 mm); only four times in 102 years has the daily rainfall exceeded 4.0 in (101.6 mm);

and only 25 times in 102 years has it exceeded 2.5 in (63.5 mm). Table 2 shows a listing of the higher intensity storms. Information on rainfall extremes for Portland and other U.S. cities are included in a U.S. Weather Bureau Technical Paper (1963).

Table 2.--Higher intensity storms at the U.S. Customs House in Portland, Oreg., 1872-1973

Date	Precipitation Maximum intensities (inches)						
	Minutes			Hours			Total
	5	15	30	1	6	24	
Dec. 12-13, 1882	--	--	--	--	--	7.66	10.75
Jan. 5-6, 1883	--	--	--	--	--	5.55	7.23
Aug. 8, 1900	0.40	0.93	1.10	1.20	1.70	1.75	1.75
Jan. 17-18, 1911	.50	.15	.20	.30	1.45	4.50	6.11
June 6, 1927	.25	.70	1.10	1.30	2.03	2.10	2.10
Dec. 26-29, 1937	.05	.10	.25	.35	1.60	3.99	9.08
June 5-6, 1953	.35	.45	.55	.65	1.05	1.40	1.40
Aug. 30, 1954	.40	.55	.60	.60	.75	.75	.75
Sept. 17-18, 1969 ^{1/}	.20	.35	.45	.55	1.85	2.80	2.80
Jan. 22-23, 1970	.15	.45	.60	.85	1.55	2.45	2.50

1/ City of Portland design storm.

SELECTED REFERENCES

- McKenzie, S. W., and Miller, T. L., 1976, Basic data on urban storm-water quality, Portland, Oregon: U.S. Geol. Survey Open-File Rept. 76-594, 71 p.
- U.S. Soil Conservation Service, 1975, Urban hydrology for small watersheds: U.S. Soil Conserv. Service Tech. Release No. 55, 92 p.
- U.S. Weather Bureau, 1963, Maximum recorded United States point rainfall for 5 minutes to 24 hours at 296 first-order stations: Washington, D.C., U.S. Weather Bur. Tech. Paper No. 2, 56 p.
- Wisler, C. O., and Brater, E. F., 1959, Hydrology [2d ed.]: New York, John Wiley & Sons, Inc., 408 p.

TABLE 3.—DAILY PRECIPITATION—Continued

STATION NUMBER
LATITUDE 45274314211301 TRYON CREEK TRIB AT DOLPH CT AT PORTLAND, OREG.
LONGITUDE 1224218

RAINFALL (IN.). WATER YEAR OCTOBER 1976 TO SEPTEMBER 1977

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.00	0.20	.00	.00	.00	0.09	.00	0.07	0.02	.00	.00	0.02
2	0.06	.00	.00	0.05	.00	0.51	.00	0.58	0.62	.00	.00	0.08
3	.00	.00	.00	0.20	.00	0.02	.00	0.59	0.32	0.13	.00	0.43
4	.00	.00	.00	.00	.00	.00	.00	0.16	.00	0.07	.00	0.15
5	.00	.00	.00	0.05	.00	0.01	.00	0.13	.00	.00	.00	.00
6	.00	.00	.00	.00	.00	0.36	.00	.00	.00	0.01	.00	.00
7	.00	.00	.00	.00	.00	0.59	.00	0.18	.00	.00	.00	.00
8	.00	.00	0.25	.00	.00	0.47	0.24	0.02	.00	.00	.00	.00
9	.00	.00	0.05	.00	0.25	0.19	.00	0.01	.00	.00	.00	.00
10	.00	.00	0.01	0.03	0.01	0.01	.00	0.33	.00	.00	.00	.00
11	.00	.00	.00	0.05	0.03	0.37	.00	.00	.00	.00	.00	.00
12	.00	.00	0.01	0.08	0.02	0.62	0.11	.00	.00	.00	.00	.00
13	.00	0.11	.00	0.56	.00	0.02	0.07	.00	.00	.00	.00	.00
14	.00	0.19	0.01	.00	.00	0.03	0.01	0.30	.00	.00	.00	.00
15	.00	0.36	.00	0.02	.00	.00	0.15	0.22	.00	.00	.00	.00
16	.00	0.01	0.01	.00	.00	0.01	0.03	0.66	.00	.00	.00	0.12
17	.00	0.26	0.05	.00	.00	.00	.00	0.09	.00	0.44	.00	0.07
18	.00	.00	.00	.00	.00	0.09	0.01	.00	.00	0.02	.00	0.39
19	.00	0.01	0.01	.00	.00	0.09	.00	.00	.00	.00	.00	0.28
20	.00	.00	0.01	.00	0.20	0.01	.00	.00	0.04	.00	.00	0.30
21	.00	0.06	.00	.00	0.40	.00	0.05	.00	.00	.00	0.03	0.06
22	.00	.00	0.15	.00	0.32	0.10	.00	.00	.00	.00	.00	.00
23	0.30	.00	0.25	.00	0.26	0.28	.00	0.29	.00	.00	1.17	0.61
24	0.37	0.04	.00	.00	0.32	0.04	.00	0.01	.00	.00	0.39	0.11
25	0.23	.00	0.50	0.20	0.23	.00	0.11	0.20	.00	0.03	1.55	0.36
26	.00	0.01	0.35	.00	0.05	0.06	.00	0.16	.00	.00	0.01	.00
27	.00	0.04	.00	.00	0.56	0.20	.00	0.17	.00	.00	.00	0.17
28	0.16	0.11	0.02	.00	0.71	0.10	.00	0.04	.00	.00	0.04	0.20
29	0.01	0.04	0.04	.00	---	.00	.00	.00	.00	.00	0.30	0.34
30	0.22	.00	.00	0.01	---	.00	.00	0.42	.00	.00	0.12	0.04
31	0.31	---	.00	0.01	---	0.09	---	0.71	---	.00	.00	---
TOTAL	1.66	1.44	1.72	1.26	3.36	4.36	0.78	5.34	1.00	0.70	3.61	3.73

WTR YR 1977 TOTAL 28.96

Table 4.--Selected storm data

[E, estimate; RG, rain gage; SG, stream gage]

Station number and name: 14143580 - Kelly Creek at Kane Road near Gresham, Oreg.

Location: Lat 45°30'44", long 122°23'56".

Control: At low stages, it is a rock and gravel riffle; at high stages, it is a large 13- by 8½-ft arch culvert (type II flow).

Datum: Zero datum is 0.08 ft below upstream invert.

Remarks: Low-stage control shifts, and the point of zero flow varies from 0.1 to 1.0 ft.

Rain gage (1) station no. 14142570

Location: Lat 45°29'26", long 122°22'54", at Powell Valley Grade School on Powell Valley Road.

Storm								Rain gage no.	Precipitation (inches)							Discharge peak							Remarks		
Begin				End					Maximum intensities							Time			Magnitude						
Year	Month	Day	Hour	Year	Month	Day	Hour		Minutes	5	15	30	1	6	24	Total	Year	Month	Day	Hour	Minute	Gage height (ft)	Discharge (ft ³ /s)		
1975	10	03	00	1975	10	03	24	1	0.03	0.08	0.14	0.24	0.37	1.15	1.15	1	1975	10	03	07	00	1.35	12		
1975	11	14	00	1975	11	15	24	1	.08	.13	.21	.30	.64	.99	1.40	2	1975	11	15	02	00	2.00	48		
1975	11	30	01	1975	12	01	24	1	.03	.08	.13	.20	.84	2.01	3.08	1	1975	11	30	12	20	2.39	83		
1975	12	03	--	1975	12	04	--	1		No date						1	1975	12	04	07	40	3.88	240	RG equipment failure.	
1975	12	23	00	1975	12	23	24	1	.03	.06	.09	.16	.74	1.32	1.32	1	1975	12	23	14	20	2.72	117		
1976	02	27	00	1976	02	27	24	1	.08	.18	.32	.59	1.47	2.05	6.80	1	1976	02	27	11	50	4.59	301	5-day precipitation total.	
1976	03	22	03	1976	03	22	24	1	.05	.12	.20	.27	.64	1.09	1.09	1	1976	03	22	13	20	2.15	96		
1977	02	20	11	1977	02	21	24	1	.08	.16	.22	.19	.66	.70	1.36	2	1977	02	20	14	55	1.46	24		
1977	02	27	18	1977	03	01	24	1	.04	.08	.14	.21	.75	1.43	2.58	2	1977	02	27	23	55	1.92	57		
1977	03	06	14	1977	03	09	24	1	.05	.11	.15	.27	.90	1.06	3.23	3	1977	03	07	18	35	2.44	108		
1977	08	25	07	1977	03	26	12	1	.06	.14	.22	.27	1.14	1.62	1.65	1	1977	08	25	19	50	2.11	42		
1977	11	25	--	1977	11	25	--	1		No date						1	1977	11	25	01	50	3.49	178	RG inoperative.	
1977	12	02	03	1977	12	03	20	1	.05	.10	.17	.32	1.54	2.62	3.09	1	1977	12	02	14	25	5.18	389	RG data from nearby station.	
1977	12	11	00	1977	12	15	24	1	.04	.12	.22	.43	1.62	3.08	6.63	3	1977	12	13	10	05	6.60	530	Do.	

Table 4.--Selected storm data--Continued

Station number and name: 14144690 - Vancouver sewer outfall near I-5 bridge at Vancouver, Wash.

Location: Lat $45^{\circ}37'21''$, long $122^{\circ}40'14''$.

Control: A 90° sharp crested weir set on the end of a 5-ft-diameter concrete sewer pipe set 0.15 in above invert of pipe.

Datum: Zero datum is at bottom of weir notch.

Rain gage (1) station no. 14144680

Location: Lat $45^{\circ}37'54''$, long $122^{\circ}40'08''$, on Vancouver City Hall building in Vancouver, Wash.

Storm								Rain gage no.	Precipitation (inches)								Discharge peak								Remarks				
Begin				End					Maximum intensities								Time		Magnitude										
Year	Month	Day	Hour	Year	Month	Day	Hour		5	15	30	1	6	24	Total	Year	Month	Day	Hour	Minute	Gage height (ft)	Discharge (ft ³ /s)							
1976	05	01	17	1976	05	01	20		1	0.11	0.20	0.25	0.25	0.45	0.47	0.47	No data								SG inoperative.				
1977	02	20	11	1977	02	22	20		1	.02	.05	.06	.09	.21	.24	.64	3	1977	02	20	13	15	2.36	18					
1977	02	27	16	1977	02	28	24		1	.05	.09	.14	.21	.45	.63	.74		1	1977	02	27	18	00	2.87	33				
1977	03	07	13	1977	03	09	24		1	.04	.08	.12	.21	.38	.64	.89	2	1977	03	07	17	05	2.96	37					
1977	03	23	11	1977	03	23	17		1	.05	.10	.10	.10	.17	.20	.20		1	1977	03	23	13	30	3.01	39				
1977	05	01	20	1977	05	02	24		1	.03	.06	.13	.13	.34	.59	.62	1	1977	05	01	22	05	2.65	27					
1977	05	16	11	1977	05	16	24		1	.03	.08	.08	.08	.32	.44	.44		1	1977	05	16	14	10	2.86	33				
1977	06	03	10	1977	06	04	20		1	.02	.05	.08	.14	.46	.82	.86	2	1977	06	03	20	10	2.36	18					
1977	07	25	10	1977	07	25	15		1	.07	.14	.17	.18	.18	.18	.18		1	1977	07	25	10	50	2.85	32				
1977	08	23	10	1977	08	24	07		1	.04	.10	.17	.30	.89	1.69	2.79	1	1977	08	23	16	55	2.69	30					
1977	11	25	--	1977	11	25	--		1	.03	--	--	.11	.35	.87	.87		1977	11	25	15	05	1.68	7.6	Not on computer system.				
1977	12	02	00	1977	12	02	18		1	.03	.06	.10	.20	1.08	1.37	1.37	1	1977	12	02	10	05	2.78	32					
1977	12	10	00	1977	12	13	17		1	.04	.09	.17	.30	1.18	2.41	3.38		2	1977	12	13	08	25	3.58	62				

Table 4.--Selected storm data--Continued

Station number and name: 14206320 - Beaverton Creek near Cedar Hills Boulevard at Beaverton, Oreg.

Location: Lat 45°29'02", long 122°48'11".

Control: At low stages, a grass and silt riffle; at high stages, channel control subject to backwater.

Datum: Zero datum of gage is 1.84 ft above the upstream invert of the right bank culvert located under Carl Braun Drive.

Remarks: The low-stage control shifts due to vegetative growth and debris in channel. When overbank flow occurs, the rating shifts due to water entering the channel from adjacent fields (storage).

Rain gage (1) station no. 14206310

Location: Lat 45°29'37", long 122°45'21", at Raleigh Park Grade School above Raleigh Park in West Slope.

Rain gage (2) station no. 14206315

Location: Lat 45°29'02", long 122°48'11", on Beaverton City Hall on Hall Boulevard in Beaverton.

Storm								Rain gage no.	Precipitation (inches)								Discharge peak						Remarks	
Begin				End					Minutes			Hours				Total	Time			Magnitude				
Year	Month	Day	Hour	Year	Month	Day	Hour		5	15	30	1	6	24	Year	Month	Day	Hour	Minute	Gage height (ft)	Discharge (ft ³ /s)			
1975	12	03	03	1975	12	04	24	1 2	0.06	0.11	0.15	0.29 No data	1.20	1.93	2.15		No data					270	SG equipment failure. Discharge estimated.	
1976	02	24	05	1976	02	28	12	1 2	.04	.11	.19	.33 .32	.89	1.66 1.61	3.15 3.16	3	1976	02	27	10	20	7.55	279	
1976	03	24	00	1976	03	24	24	1 2	.02	.04	.08	.12 .10	.47	.67 .60	.67 .60	1	1976	03	24	06	15	4.29	127	
1976	09	14	00	1976	09	14	24	1 2	.02	.06	.11	.21 .21	.52	.56 .52	.56 .56	1	1976	09	14	07	05	2.20	53	
1977	02	20	10	1977	02	21	24	1 2	.04	.07	.12	.15 .11	.23	.42 .45	.64 .65	1	1977	02	21	21	35	1.19	22	
1977	02	27	00	1977	02	28	24	1 2	.02	.06	.09	.17 .15	.43	.51 .52	1.00 .97	1	1977	02	27	23	15	2.13	48	
1977	03	07	02	1977	03	09	12	1 2	.11	.19	.22	.26 .29	.46	.65 .51	1.36 1.43	2	1977	03	08	22	50	3.84	109	
1977	08	23	11	1977	08	26	12	1 2	.04	.08	.11	.19 .20	.91	1.35 .81	2.93 1.30	2	1977	08	24	02	55	4.04	113	
1977	12	02	00	1977	02	03	24	1 2	.03	.07	.12	No data .23	1.09	1.44 1.44	1.48	1	1977	12	02	14	00	6.01	202	RG No. 1 not operating.
1977	12	10	00	1977	02	15	24	1 2	.04	.12	.21	No data .36	1.42	2.69 6.30		3	1977	12	13	13	00	9.04	389	Do.

Table 4.--Selected storm data--Continued

Station number and name: 14206330 - Beaverton Creek tributary at SW. Murray Boulevard at Beaverton, Oreg.

Location: Lat $45^{\circ}20'08''$, long $122^{\circ}51'41''$.
 Control: A 2-ft diameter concrete culvert (Type I to V control).
 Datum: Zero datum is 0.07 ft above upstream culvert invert.
 Rain gage (1) station no. 14206330
 Location: At stream-gage site.

Storm								Rain gage no.	Precipitation (inches)						Number of events	Discharge peak						Remarks			
Begin				End													Time			Magnitude					
Year	Month	Day	Hour	Year	Month	Day	Hour		Maximum intensities			Hours				Year	Month	Day	Hour	Minute	Gage height (ft)	Discharge (ft ³ /s)			
									5	15	30	1	6	24	Total										
1975	10	17	12	1975	10	17	24	1	0.04	0.08	0.14	0.17	0.31	0.49	0.49	1	1975	10	17	22	15	0.89	3.8		
1975	11	14	00	1975	11	15	14	1	.03	.08	.13	.25	.48	.77	.99	2	1975	11	15	00	30	1.09	5.6		
1975	12	03	03	1975	12	04	09	1	.03	.08	.16	.32	1.35	2.05	2.35	1.	1975	12	04	03	00	1.66	11		
1976	02	27	00	1975	02	27	24	1	.04	.11	.19	.33	.89	1.33	3.24	1	1976	02	27	08	50	1.71	12	Five-day storm total.	
1976	03	23	14	1976	03	24	24	1	.03	.06	.09	.11	.43	1.00	1.67	1	1976	03	24	05	50	.93	4.3	Three-day storm total.	
1976	08	15	03	1976	08	15	19	1	.13	.20	.21	.21	.52	.91	.91	1	1976	08	15	14	20	1.56	10		
1977	03	07	13	1977	03	08	24	1	.16	.19	.22	.28	.58	.64	1.18	2	1977	03	07	17	15	1.33	8.0		
1977	03	11	18	1977	03	12	14	1	.02	.05	.09	.09	.23	.61	.62	1	1977	03	12	05	15	.59	1.6		
1977	08	23	10	1977	08	26	06	1	.03	.06	.10	.17	.77	1.32	3.05	2	1977	08	25	15	25	.89	3.8		
1977	10	29	00	1977	10	30	24	1	.03	.05	.09	.13	.26	.71	.84	1	1977	10	29	13	20	.82	3.3		
1977	12	--	--	1977	12	--	--		No data								1977	12	--	--	--	1.64	11	RG and SG inoperative. Gage height from crest-gage mark.	

Table 4.--Selected storm data--Continued

Station number and name: 14206470 - Butternut Creek at 180th Avenue at Aloha, Oreg.

Location: Lat 45°28'52", long 122°51'41".

Control: A 1.85-ft-high dam with 90° "V" notch weir set in front of a 4- by 7-ft rectangular concrete culvert.

Datum: Zero datum is 0.77 ft below notch of weir.

Remarks: From October 1975 to March 1976 the control was a 3.0-ft-diameter concrete culvert with zero gage datum at 0.26 ft above upstream culvert invert.

Rain gage (1) station no. 14206470

Location: At stream-gage site.

S C	Storm							Rain gage no.	Precipitation (inches)						Discharge peak						Remarks					
	Begin		End						Time			Magnitude														
	Year	Month	Day	Hour	Year	Month	Day		Minutes			Hours			Total	Year	Month	Day	Hour	Minute	Gage height (ft)	Discharge (ft ³ /s)				
									5	15	30	1	6	24												
1975	11	30	01		1975	11	30	24	1	0.01	0.03	0.05	0.08	0.38	0.60	0.60	1	1975	11	30	14	45	0.78	6.3		
1975	12	03	02		1975	12	04	21	1	.04	.09	.17	.31	1.17	1.80	2.06	1	1975	12	04	03	05	3.03	43		
1975	12	22	20		1975	12	23	19	1	.01	.03	.06	.11	.41	.80	.89	1	1975	12	23	07	55	.96	8.4		
1976	01	04	00		1976	01	04	24	1	.03	.07	.12	.20	.34	.45	.45	1	1976	01	04	12	35	1.09	10		
1976	01	06	19		1976	01	07	24	1	.02	.05	.08	.13	.39	.93	.95	1	1976	01	07	12	20	1.69	19		
1976	02	24	--		1976	02	27	--	1	.04	.10	.20	.30	.80	1.60	3.00		No data						4.06	64	Equipment inoperative. RG data from nearby site.
1976	03	23	15		1976	03	24	24	1	.07	.09	.13	.15	.40	.92	1.00	1	1976	03	24	05	40	1.03	9.2		
1977	02	20	10		1977	02	22	24	1	.03	.05	.08	.10	.20	.41	.95	3	1977	02	21	21	20	1.63	1.7	Stream channel just upstream widened and deepened.	
1977	02	27	09		1977	02	28	24	1	.02	.04	.07	.14	.30	.43	.74	2	1977	02	27	18	30	1.83	3.1		
1977	03	07	02		1977	03	08	24	1	.11	.17	.19	.21	.45	.51	1.00	2	1977	03	07	17	30	2.19	11		
1977	05	02	00		1977	05	03	12	1	.04	.07	.07	.09	.19	.39	.60	2	1977	05	02	13	40	1.54	1.3		
1977	06	03	09		1977	06	04	20	1	.02	.04	.06	.09	.36	.56	.70	2	1977	06	03	16	30	1.82	3.0		
1977	07	17	16		1977	07	17	24	1	.02	.05	.08	.13	.39	.39	.39	1	1977	07	17	18	45	1.71	2.1		
1977	07	25	08		1977	07	25	15	1	.04	.07	.09	.18	.23	.23	.23	1	1977	07	25	10	20	1.68	2.0		
1977	08	23	10		1977	08	26	10	1	.04	.09	.13	.21	.66	1.27	2.76	2	1977	08	25	15	40	1.99	5.5		
1977	11	24	07		1977	11	25	24	1	.05	.09	.14	.22	.64	1.47	1.79	2	1977	11	25	14	50	2.60	23		
1977	12	02	00		1977	12	02	24	1	.03	.06	.10	.21	.99	1.36	1.36	1	1977	12	02	13	25	3.15	46		
1977	12	10	00		1977	12	15	24	1	.05	.11	.19	.35	1.46	2.05	5.66	4	1977	12	13	07	15	3.81	79		

Table 4.--Selected storm data--Continued

Station number and name: 14206900 - Fanno Creek at 56th Avenue at Portland, Oreg.

Location: Lat 45°29'17", long 122°44'01".

Control: A 6-in-diameter concrete culvert set flush in vertical headwall; Type I to V culvert entrance control.

Datum: Zero datum is 0.18 ft above upstream invert of culvert.

Rain gage (1) station no. 14206850

Location: Lat 45°29'21", long 122°41'41".

Remarks: Tipping-bucket type at KPM-FM Radio Station on Council Crest Drive.

Remarks: tipping bucket type
Rain gage (2) station no. 14206900

Location: At stream-gage site.

Storm							Rain gage no.	Precipitation (inches)						Number of events	Discharge peak						Remarks			
Begin			End			Time			Magnitude															
Year	Month	Day	Hour	Year	Month	Day	Hour	Minutes	Hours	5	15	30	1	6	24	Total	Year	Month	Day	Hour	Minute	Gage height (ft)	Discharge (ft³/s)	
1974	01	15	--							No data												+5.50	200	
1974	01	27	08	1974	01	27	20	1 2	0.03 .03	0.06 .06	0.10 .09	0.15 .12	0.44 .37	0.58 .46	0.58 .46	1	1974	01	27	13	25	2.44	49	
1974	01	31	00	1974	02	01	06	1 2	.04 .03	.12 .09	.18 .17	.28 .27	.64 .59	1.35 1.09	1.44 1.19	1	1974	01	31	20	40	3.69	102	
1974	03	27	22	1974	03	28	19	1 2	.03 .03	.08 .08	.16 .14	.29 .26	.64 .46	1.07 .88	1.61 1.46	1	1974	03	28	01	50	4.01	118	Data synthesized from on-site volume data and data from nearby stations.
1974	07	08	17	1974	07	08	23	1 2	.23 .21	.58 .53	.77 .74	.80 .77	1.08 .77	1.27 .83	1.27 .83	1	1974	07	08	19	00	4.05	120	Data synthesized from on-site volume data and data from nearby stations.
1974	10	28	08	1974	10	28	24	1 2	.02 .02	.04 .04	.08 .07	.14 .12	.51 .53	1.29 1.32	1.29 1.32	1	1974	10	28	20	45	1.76	27	
1974	11	07	00	1974	11	07	23	1 2	.08 .12	.21 .19	.29 .20	.33 .34	.64 .54	1.26 1.16	1.26 1.16	1	1974	11	07	18	10	4.58	148	
1974	12	26	12	1974	12	27	10	1 2	.04 .04	.12 .11	.21 .20	.29 .30	.72 .70	1.02 .90	1.54 1.42	1	1974	12	27	02	05	4.63	165	Data synthesized from on-site volume data and data from

Table 4.--Selected storm data--Continued

Station number and name: 14206900 - Fanno Creek at 56th Avenue at Portland, Oreg.--Continued

Table 4.--Selected storm data--Continued

Station number and name: 14206900 - Fanno Creek at 56th Avenue at Portland, Oreg.--Continued

Table 4.--Selected storm data--Continued

Station number and name: 14207800 - Singer Creek at Pearl Street at Oregon City, Oreg.

Location: Lat 45°20'57", long 122°35'58".

Control: A 3.0-ft-diameter corrugated metal pipe culvert (Type I to V control).

Datum: Zero datum is 0.29 ft above upstream culvert invert.

Rain gage (1) station no. 14207800

Location: At stream-gage site.

Storm								Precipitation (inches)								Number of events	Discharge peak						Remarks	
Begin				End										Time			Magnitude							
Year	Month	Day	Hour	Year	Month	Day	Hour	Maximum intensities			Minutes	Hours	Year	Month	Day	Hour	Minute	Gage height (ft)	Discharge (ft³/s)					
								5	15	30			1	6	24	Total								
1976	02	24	06	1976	02	27	24	1	0.05	0.09	0.15	0.26	0.77	1.53	4.54	3	1976	02	27	10	05	1.45	14	
1976	06	01	00	1976	06	01	24	1	.06	.13	.18	.19	.39	.41	.41	2	1976	06	01	19	00	.71	4.9	
1976	07	12	00	1976	07	12	24	1	.05	.07	.11	.17	.57	1.11	1.11	1	1976	07	12	20	50	.40	2.3	
1976	08	15	05	1976	08	15	24	1	.05	.10	.16	.21	.46	.84	.84	1	1976	08	15	22	30	.47	2.8	
1977	02	20	11	1977	02	22	17	1	.05	.10	.13	.16	.37	.66	1.29	2	1977	02	20	13	45	.44	2.6	
1977	02	27	16	1977	02	28	24	1	.03	.06	.10	.19	.65	.76	1.45	2	1977	02	27	18	50	.48	2.9	
1977	03	06	13	1977	03	08	24	1	.03	.06	.10	.14	.43	.49	1.34	2	1977	03	07	18	35	.48	2.9	
1977	03	26	19	1977	03	27	10	1	.04	.08	.08	.09	.28	.40	.40	2	1977	03	27	05	55	.23	1.6	
1977	08	23	06	1977	08	24	06	1	.03	.07	.12	.18	.74	1.18	1.18	1	1977	08	25	15	50	.28	1.7	
1977	12	02	00	1977	12	02	24	1	.04	.10	.18	.34	1.55	2.21	2.21	1	1977	12	02	12	55	1.33	13	
1977	12	11	00	1977	12	15	08	1	.04	.10	.18	.32	1.37	2.57	5.95	4	1977	12	13	07	35	2.28	23	RG data from nearby station.

Table 4.--Selected storm data--Continued

Station number and name: 14210400 - Noyer Creek on Highway 212 near Damascus, Oreg.

Location: Lat 45°25'06", long 122°24'31".

Control: A slightly elliptical 7-ft-diameter corrugated metal pipe culvert with mitered entrance (Type I to V control).

Datum: Zero datum is 0.31 ft below upstream invert of culvert.

Rain gage (1) station no. 14210400

Location: At stream-gage site.

	Storm								Rain gage no.	Number of events	Discharge peak						Remarks									
	Begin				End						Precipitation (inches)						Time			Magnitude						
	Year	Month	Day	Hour	Year	Month	Day	Hour			Maximum intensities			Minutes			Hours			Year	Month	Day	Hour	Minute	Gage height (ft)	Discharge (ft ³ /s)
	5	15	30		1	6	24				Total															
07	1976	01	13	12	1976	01	14	24	1	0.02	0.04	0.08	0.14	0.51	1.30	1.31	1	1976	01	14	10	15	2.74	57	Recorders inoperative. Best estimate of discharge and total precipitation.	
	1976	02	24	11	1976	02	27	24	1	.03	.07	.14	.24	.68	1.21	3.98	3	1976	02	27	10	50	3.94	120		
	1976	03	13	04	1976	03	14	24	1	.02	.04	.07	.13	.51	.87	.94	1	1976	03	13	21	40	1.21	7.9		
	1976	03	24	00	1976	03	24	24	1	.04	.04	.06	.10	.36	.65	.65	1	1976	03	24	12	45	1.79	20		
	1976	04	19	12	1976	04	20	12	1	.07	.18	.28	.47	.77	1.20	1.21	1	1976	04	20	01	05	2.57	49		
	1976	04	23	12	1976	04	24	24	1	.03	.05	.08	.14	.29	.77	.78	1	1976	04	24	01	30	1.62	14		
	1976	08	15	03	1976	08	15	24	1	.04	.09	.09	.15	.48	.73	.73	1	1976	08	15	14	00	.50	.35		
	1977	02	20	11	1977	02	21	21	1	.09	.21	.29	.29	.69	.69	1.47	2	1977	02	20	16	00	.95	2.6		
	1977	03	06	--	1977	03	09	--	1	No data			2.60			--	1977	03	07	No data			E15			
	1977	08	25	07	1977	08	26	12	1	.05	.13	.32	.53	1.44	2.21	2.21	1	1977	08	25	18	15	.86	1.9		
	1977	09	23	00	1977	09	24	24	--	.03	.09	.15	.17	.49	1.13	1.20	1	1977	09	23	15	00	.72	1.1		
	1977	11	24	08	1977	11	25	24	1	.05	.09	.16	.24	.61	.93	1.79	1	1977	11	25	16	30	3.27	82		
	1977	12	02	00	1977	12	03	24	1	.04	.08	.14	.23	1.27	1.68	2.04	1	1977	12	02	14	30	3.88	115		
	1977	12	10	00	1977	12	15	15	1	.04	.09	.17	.26	1.15	2.29	6.03	3	1977	12	13	08	25	4.67	164		

Table 4.--Selected storm data--Continued

Station number and name: 1421110 - Willamette River tributary at Old River Road at Robinwood, Oreg.

Location: Lat 45°24'01", long 122°38'37".

Control: A 5-ft-diameter corrugated metal pipe culvert (Type I to V control).

Datum: Zero datum is 0.10 ft above upstream invert of culvert.

Rain gage (1) station no. 14211105

Location: Lat 45°23'24", long 122°38'53", on View Drive located near two large water tanks at Robinwood, Oreg.

	Storm								Rain gage no.	Number of events	Discharge peak						Remarks										
	Begin				End						Precipitation (inches)																
	Year	Month	Day	Hour	Year	Month	Day	Hour			Maximum intensities			Minutes													
											5	15	30	1	6	24	Total	Year	Month	Day	Hour	Minute	Gage height (ft)	Discharge (ft³/s)			
14	1975	11	14	15	1975	11	15	24	1	1	0.13	0.20	0.24	0.33	0.52	0.78	0.84	1	1975	11	15	01	35	1.07	12		
	1975	12	03	04	1975	12	04	24	1	1	.06	.10	.17	.33	1.32	2.02	2.18	1	1975	12	04	03	45	2.78	57		
	1975	12	23	00	1975	12	24	21	1	1	.02	.04	.06	.11	.47	.94	1.11	1	1975	12	23	12	25	1.07	12		
	1976	02	24	09	1976	02	27	24	1	1	.04	.10	.19	.33	.80	1.42	4.24	3	1976	02	27	09	50	3.01	62		
	1976	03	22	03	1976	03	24	24	1	1	.04	.07	.10	.18	.74	1.76	2.70	2	1976	03	24	02	35	1.41	21		
	1977	02	20	11	1977	02	22	24	1	1	.05	.10	.14	.19	.32	.62	1.04	3	1977	02	21	19	30	.53	2.2		
	1977	02	27	02	1977	02	28	24	1	1	.03	.05	.07	.14	.49	1.02	1.15	2	1977	02	27	23	35	.70	4.3		
	1977	03	06	13	1977	03	09	12	1	1	.07	.17	.22	.26	.39	.53	1.78	3	1977	03	08	22	20	1.12	9.9		
	1977	03	11	00	1977	03	12	24	1	1	.03	.08	.09	.12	.47	.99	1.01	1	1977	03	12	13	30	1.03	8.5		
	1977	08	23	16	1977	08	26	05	1	1	.07	.12	.17	.30	1.13	1.61	3.34	1	1977	08	25	18	00	.93	7.0		
	1977	11	24	00	1977	11	25	24	1	1	.04	.10	.14	.24	.70	1.12	2.04	1	1977	11	25	12	30	2.38	37		
	1977	12	02	00	1977	12	03	24	1	1	.05	.12	.19	.32	1.46	2.43	2.63	1	1977	12	02	15	15	3.20	60		
	1977	12	11	00	1977	12	16	12	1	1	.04	.12	.21	.33	1.33	2.68	6.97	4	1977	12	13	08	25	5.20	123		

Table 4.--Selected storm data--Continued

Station number and name: 14211120 - Willamette River tributary at SE. River Road at Oak Grove, Oreg.

Location: Lat 45°24'34", long 122°38'39".

Control: A 4.6-ft-diameter corrugated metal pipe culvert (Type I to V control).

Datum: Zero datum is 0.16 ft above upstream invert of culvert.

Rain gage (1) station no. 14211115

Location: Lat 45°24'57", long 122°37'53", on Oak Lodge RFD No. 4 garage at Oak Grove, Oreg.

Storm								Precipitation (inches)								Number of events	Discharge peak						Remarks		
Begin				End				Maximum intensities									Time		Magnitude						
Year	Month	Day	Hour	Year	Month	Day	Hour	Minutes			Hours			Total	Year	Month	Day	Hour	Minute	Gage height (ft)	Discharge (ft ³ /s)				
								5	15	30	1	6	24		Year	Month	Day	Hour	Minute						
42	1975	10	21	00	1975	10	21	24	1	0.02	0.05	0.09	0.15	0.62	0.90	0.90	1	1975	10	21	07	35	1.11	10	
	1975	12	03	06	1975	12	04	12	1	.07	.12	.20	.38	1.46	2.32	2.32	1	1975	12	04	03	50	2.36	39	
	1975	12	22	23	1975	12	23	24	1	.02	.06	.08	.13	.53	1.15	1.37	1	1975	12	23	12	05	1.45	17	
	1976	01	03	06	1976	01	05	24	1	.07	.16	.19	.21	.46	1.19	1.98	3	1976	01	04	19	25	1.75	24	
	1976	02	24	10	1976	02	27	24	1	.05	.13	.25	.44	1.01	1.69	5.32	3	1976	02	27	09	25	3.08	59	
	1976	03	22	03	1976	03	24	24	1	.04	.07	.10	.18	.74	1.76	1.85	2	1976	03	23	21	10	1.68	22	
	1976	08	24	17	1976	08	25	24	1	.09	.18	.23	.25	.35	.51	.99	2	1976	08	25	15	15	1.28	13	
	1977	02	20	11	1977	02	22	24	1	.06	.12	.23	.30	.54	.87	1.64	3	1977	02	21	19	00	1.58	20	
	1977	03	06	13	1977	03	09	12	1	.08	.16	.24	.27	.67	.73	2.09	3	1977	03	07	18	10	1.81	25	
	1977	08	25	16	1977	08	26	05	1	.07	.12	.17	.30	1.13	1.61	1.62	1	1977	08	25	17	55	1.85	26	RG data from 14211105 site.
	1977	11	24	00	1977	11	25	24	1	.04	.10	.14	.24	.67	1.12	2.04	2	1977	11	25	12	10	1.88	27	
	1977	12	02	00	1977	12	03	24	1	.04	.10	.18	.34	1.55	2.21	2.41	1	1977	12	02	14	25	2.96	55	
	1977	12	11	00	1977	12	15	24	1	.04	.10	.18	.32	1.37	2.57	5.95	4	1977	12	13	07	50	3.40	68	

Table 4.--Selected storm data--Continued

Station number and name: 14211130 - Kellogg Creek at Rusk Road at Milwaukie, Oreg.

Location: Lat 45°25'23", long 122°36'09".

Control: Two parallel 215-ft-diameter concrete culverts (Type I to V control).

Datum: Zero datum is 0.20 ft above upstream invert of right bank culvert.

Rain gage (1) station no. 14211125

Location: Lat 45°24'23", long 122°35'18", on Bilquist Grade School at Webster Road at Milwaukie, Oreg.

E4

Storm								Rain gage no.	Precipitation (inches)						Discharge peak						Remarks			
Begin				End					Maximum intensities						Time		Magnitude							
Year	Month	Day	Hour	Year	Month	Day	Hour		5	15	30	1	6	24	Total	Year	Month	Day	Hour	Minute	Gage height (ft)	Discharge (ft ³ /s)		
1975	10	21	00	1975	10	21	24	1	0.02	0.05	0.08	0.15	0.64	0.95	0.95	1	1975	10	21	09	15	0.86	10	
1975	12	03	05	1975	12	04	24	1	.07	.12	.18	.25	1.00	1.80	1.93	1	1975	12	04	05	20	2.75	59	
1975	12	23	00	1975	12	23	24	1	.02	.05	.08	.13	.57	1.13	1.13	1	1975	12	23	13	10	1.50	23	
1976	02	16	00	1976	02	18	12	1	.04	.06	.10	.14	.37	.54	.54	2	1976	02	17	13	10	1.44	22	
1976	02	24	10	1976	02	28	12	1	.05	.11	.17	.31	.84	1.65	3.94	3	1976	02	27	10	20	3.84	82	
1976	03	22	03	1976	03	24	24	1	.02	.05	.08	.13	.47	1.03	1.71	2	1976	03	24	02	35	1.58	28	
1976	04	07	04	1976	04	08	24	1	.06	.11	.17	.20	.28	.50	.62	2	1976	04	08	17	40	1.08	15	
1976	08	24	17	1976	08	25	24	1	.11	.16	.23	.24	.47	.59	.89	2	1976	08	25	15	55	.70	5.3	
1977	02	20	08	1977	02	22	24	1	.05	.10	.15	.18	.43	.57	1.32	3	1977	02	21	19	25	.89	11	
1977	02	27	04	1977	02	28	24	1	.02	.05	.08	.14	.48	.58	1.04	1	1977	02	27	23	30	1.00	13	
1977	03	06	09	1977	03	09	12	1	.10	.22	.30	.33	.47	.58	1.71	3	1977	03	07	18	35	1.46	25	
1977	08	25	16	1977	08	26	12	1	.07	.12	.17	.30	1.13	1.61	1.62	1	1977	08	25	18	30	1.89	36	RG data from 14211105 site.
1977	11	24	09	1977	11	25	24	1	.04	.07	.10	.16	.55	.94	1.83	2	1977	11	25	13	10	2.04	41	
1977	12	02	00	1977	12	03	24	1	.04	.09	.16	.31	1.43	2.04	2.27	1	1977	12	02	14	50	4.09	89	
1977	12	11	00	1977	12	16	24	1	.04	.10	.18	.28	1.24	2.32	5.46	4	1977	12	13	08	45	3.83	84	

Table 4.--Selected storm data--Continued

Station number and name: 14211301 - Tryon Creek tributary at Dolph Court at Portland, Oreg.

Location: Lat 45°27'43", long 122°42'18".

Control: A 3.0-ft-diameter corrugated metal pipe culvert (Type I to V control).

Datum: Zero datum is 0.03 ft above upstream invert of culvert.

Rain gage (1) station no. 14211301

Location: At stream-gage site.

Storm								Rain gage no.	Precipitation (inches)								Discharge peak								Remarks												
Begin				End					Maximum intensities								Time				Magnitude																
Year	Month	Day	Hour	Year	Month	Day	Hour		Minutes		Hours																										
									5	15	30	1	6	24	Total																						
1975	01	03	00	1975	01	04	02	1	0.05	0.13	0.21	0.26	0.80	1.14	1.23	2	1975	01	03	19	50	2.21	21		RG inoperative; data from 14206850 site.												
1975	01	24	01	1975	01	25	24	1	.02	.05	.10	.19	.63	1.71	2.54	3	1975	01	25	02	35	1.76	15														
1975	02	12	00	1975	02	12	24	1	.11	.20	.30	.40	1.14	1.23	1.23	1	1975	02	12	11	10	3.66	47														
1975	03	02	12	1975	03	02	24	1	.09	.16	.22	.25	.32	.56	.56	1	1975	03	02	20	25	1.70	14														
1975	03	18	00	1975	03	19	24	1	.05	.11	.19	.23	.79	1.25	1.75	2	1975	03	18	11	10	1.88	16														
1975	05	02	05	1975	05	03	24	1	.07	.12	.12	.16	.55	1.18	1.49	1	1975	05	03	00	25	1.64	13														
1975	11	14	00	1975	11	15	20	1	.14	.23	.32	.46	.81	1.33	1.68	3	1975	11	15	01	05	1.69	14														
1975	12	03	03	1975	12	04	17	1	.05	.08	.15	.28	1.09	1.92	2.26	1	1975	12	04	03	35	2.20	21														
1976	02	27	00	1976	02	27	17	1	.03	.09	.16	.30	.86	1.21	3.19	1	1976	02	27	09	45	2.39	24		RG inoperative; data from 14206900 site. Five-day precipitation total.												
1976	03	22	02	1976	03	24	24	1	.03	.06	.10	.16	.50	1.16	1.87	2	1976	03	24	01	45	1.42	10														
1976	08	15	05	1976	08	15	20	1	.17	.23	.24	.25	.58	.98	.98	1	1976	08	15	16	35	1.78	15														
1976	08	24	16	1976	08	25	07	1	.08	.18	.24	.28	.55	.79	.79	2	1976	08	24	19	40	1.52	11														
1977	02	27	02	1977	02	28	24	1	.06	.13	.18	.24	.49	1.10	1.22	1	1977	02	28	05	50	1.81	15														
1977	03	06	13	1977	03	09	05	1	.12	.17	.19	.24	.45	.62	1.42	3	1977	03	07	17	40	1.88	16														
1977	05	16	--	1977	05	16	--	1	.11	.15	.18	.21	.45	.66	.66	1	1977	05	16	14	20	1.49	11														
1977	08	25	09	1977	08	26	05	1	.05	.08	.12	.23	.89	1.55	1.56	1	1977	08	25	20	25	1.31	8.7														
1977	11	24	07	1977	11	25	24	1	.04	.09	.14	.19	.60	1.53	1.72	2	1977	11	25	13	35	1.58	12														
1977	12	02	00	1977	12	03	24	1	.04	.10	.18	.35	1.53	1.97	1.97	2	1977	12	02	13	40	2.71	30														
1977	12	11	00	1977	12	15	24	1	.06	.14	.23	.43	1.77	3.26	6.48	4	1977	12	13	06	55	4.60	54														

Table 4.--Selected storm data--Continued

Station number and name: 14211450 - Johnson Creek tributary on Roberts Avenue at Gresham, Oreg.

Location: Lat $45^{\circ}29'26''$, long $122^{\circ}25'22''$.

Control: A 4.0-ft-diameter corrugated metal pipe culvert (Type I and V control).

Datum: Zero datum is 0.53 ft below upstream culvert invert.

Remarks: Point of zero flow is at -0.30 ft from zero datum.

Rain gage (1) station no. 14211450

Location: At stream-gage site.

Storm								Rain gage no.	Precipitation (inches)						Number of events	Discharge peak						Remarks			
Begin				End					Maximum intensities								Time		Magnitude						
Year	Month	Day	Hour	Year	Month	Day	Hour		Minutes	Hours	5	15	30	1	6	24	Total	Year	Month	Day	Hour	Minute	Gage height (ft)	Discharge (ft ³ /s)	
1975	12	23	05	1975	12	25	20	1	0.02	0.04	0.07	0.14	0.62	1.29	1.29	1	1975	12	25	12	35	1.84	10		
1976	02	25	00	1976	02	27	24	1	.04	.10	.18	.30	.77	1.31	2.82	3	1976	02	27	10	05		2.58	27	
1976	03	23	14	1976	03	24	16	1	.02	.05	.08	.14	.50	1.08	1.09	1	1976	03	24	02	20		1.62	6.2	
1977	02	20	11	1977	02	21	21	1	.05	.13	.18	.21	.38	.46	.85	2	1977	02	20	14	20		1.36	1.8	
1977	02	27	13	1977	03	01	19	1	.03	.07	.12	.19	.61	1.04	1.64	2	1977	02	27	18	50		1.37	1.8	
1977	03	06	14	1977	03	09	12	1	.11	.24	.35	.43	.55	.82	2.09	3	1977	03	07	18	15		1.67	5.9	
1977	03	28	14	1977	03	28	22	1	.03	.09	.13	.15	.25	.26	.26	1	1977	03	28	15	55		1.22	.86	
1977	08	25	07	1977	08	25	23	1	.06	.14	.22	.28	1.16	1.62	1.65	1	1977	08	25	19	45		1.53	3.5	
1977	09	20	17	1977	09	21	10	1	.06	.15	.21	.24	.30	.59	.59	1	1977	09	20	23	25		1.28	1.2	
1977	12	02	00	1977	12	03	24	1	.05	.10	.17	.32	1.54	2.62	3.09	2	1977	12	02	09	05		1.67	5.9	
1977	12	11	00	1977	12	15	24	1	.04	.12	.22	.43	1.62	3.08	6.63	4	1977	12	13	11	50		2.10	15	

Table 4.--Selected storm data--Continued

Station number and name: 14211800 - Saltzman Creek at Balboa Avenue at Portland, Oreg.

Location: Lat 45°33'54", long 122°44'38".

Control: An 18.0- by 4.0-ft concrete flume with web and contoured wingwalls.

Datum: Zero datum is 0.76 ft below upstream culvert invert.

Remarks: Other data are available from a crest gage located at this site from December 1954 to present.

Rain gage (1) station no. 14211800

Location: At stream-gage site.

Storm								Rain gage no.	Precipitation (inches)						Discharge peak						Remarks			
Begin				End											Time			Magnitude						
Year	Month	Day	Hour	Year	Month	Day	Hour		Maximum intensities			Minutes			Hours			Total						
									5	15	30	1	6	24										
1975	11	29	--	1975	11	30	--		1	0.04	0.10	0.17	0.30	0.84	1.38	1.47	1	1975	11	30	--	E2.2 90	Estimated from poor high-water mark.	
1976	02	25	00	1976	02	28	12		1	.03	.06	.12	.21	.71	1.16	2.88	2	1976	02	27	09	55	2.03 70	
1976	03	24	01	1976	03	24	20		1	.02	.04	.07	.07	.33	.49	1.67	1	1976	03	24	13	45	1.40 12	Three-day precipitation total.
1976	08	15	00	1976	08	15	22		1	.06	.14	.16	.17	.48	.79	.79	1	1976	08	15	14	40	1.05 1.9	
1977	08	23	--	1977	08	25	--		1	.04	.10	.20	.30	.90	1.49	3.55		1977	08	25	--	--	1.2 4.7	Both gages inoperative. Data synthesized from nearby rain-gage data.
1977	11	24	08	1977	11	25	24		1	.05	.09	.16	.24	.63	1.14	1.85	1	1977	11	25	07	40	1.77 42	
1977	12	02	01	1977	12	03	24		1	.03	.08	.14	.26	1.42	1.77	1.83	1	1977	12	02	14	00	2.37 112	
1977	12	10	00	1977	12	17	24		1	.04	.11	.22	.40	1.61	2.99	7.11	2	1977	12	13	06	40	3.45 315	

Table 4.--Selected storm data--Continued

Station number and name: 14211950 - Vancouver Lake tributary at Lake Shore Drive near Vancouver, Wash.

Location: Lat $45^{\circ}41'36''$, long $122^{\circ}42'03''$.

Control: A 2.0-ft-diameter concrete culvert (Type I and V control).

Datum: Zero datum is 0.25 ft below upstream culvert invert.

Remarks: Point of zero flow is at invert.

Rain gage (1) station no. 14211950

Location: At stream-gage site.

Storm								Rain gage no.	Precipitation (inches)								Discharge peak						Remarks			
Begin				End					Maximum intensities						Time		Magnitude									
Year	Month	Day	Hour	Year	Month	Day	Hour		Minutes	5	15	30	1	6	24	Total	Year	Month	Day	Hour	Minute	Gage height (ft)	Discharge (ft ³ /s)			
1975	10	17	11	1975	10	17	23	1	0.02	0.05	0.08	0.14	0.32	0.42	0.42	1	1975	10	17	20	50	1.66	7.73			
1975	10	25	00	1975	10	25	12	1	.02	.06	.10	.16	.54	.61	.61	1	1975	10	25	07	35	1.77	8.68			
1975	12	03	00	1975	12	04	08	1	.08	.16	.24	.35	1.32	1.98	2.15	1	1975	12	04	03	05	4.47	23			
1976	01	07	00	1976	01	07	16	1	.04	.07	.14	.26	.80	1.29	1.29	1	1976	01	07	12	00		1.85	9.35		
1976	02	24	--	1976	02	24	24	1	.03	.06	.10	.14	.43	.54	.54	1	1976	02	24	20	15		1.26	4.23		
1976	02	26	10	1976	02	28	07	1	.08	.15	.23	.39	1.28	2.11	2.92	3	1976	02	27	08	10		2.72	14		
1976	04	08	00	1976	04	08	20	1	.12	.17	.17	.19	.38	.52	.52	2	1976	04	08	14	30		2.99	16		
1976	05	01	17	1976	05	01	20	1	.34	.54	.63	.64	.92	.92	.92	1	1976	05	01	--	--		6.98	36	SG recorder flooded. Hailstorm occurred.	
1976	08	14	17	1976	08	15	20	1	.14	.21	.26	.30	.53	1.07	1.38	3	1976	08	15	17	35		3.11	16		
1977	02	20	11	1977	02	22	11	1	.03	.07	.09	.10	.23	.27	.65	3	1977	02	21	12	30		1.99	10		
1977	08	23	10	1977	08	24	06	1	.04	.09	.15	.24	.82	1.48	1.94	1	1977	08	23	17	35		2.07	11		
1977	09	17	00	1977	09	17	24	1	.17	.32	.35	.40	.64	.64	.64	1	1977	09	17	17	20		3.63	19		
1977	12	02	00	1977	12	02	24	1	.03	.06	.12	.19	.98	1.39	1.39	1	1977	12	02	10	05		2.07	11	RG data from nearby site.	
1977	12	12	12	1977	12	15	17	1	.04	.09	.16	.27	1.13	2.55	4.11	4	1977	12	13	08	50		3.13	16		

Table 4.--Selected storm data--Continued

Station number and name: 14213040 - Cougar Creek on NE. 13th Avenue at Vancouver, Wash.

Location: Lat 45°42'35", long 122°40'58".

Control: A 4.5-ft-diameter corrugated metal pipe culvert (Type I to V control).

Datum: Zero datum is 0.16 ft above upstream culvert invert.

Rain gage (1) station no. 14213030

Location: Lat 45°41'38", long 122°40'40", on Columbia River High School near Vancouver, Wash.

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Storm								Rain gage no.	Precipitation (inches)					Discharge peak						Remarks				
Begin				End					Maximum intensities			Time		Magnitude										
Year	Month	Day	Hour	Year	Month	Day	Hour		Minutes	Hours	1	6	24	Total	Year	Month	Day	Year	Minute	Gage height (ft)	Discharge (ft ³ /s)			
									5	15	30					Year	Month	Day	Year	Minute				
1975	10	28	03	1975	10	30	24	1	0.02	0.06	0.11	0.15	0.49	1.09	1.86	1	1975	10	30	07	55	2.11	20	
1975	12	03	00	1975	12	04	08	1	.03	.15	.20	.30	1.02	1.56	1.74	1	1975	12	04	No data		3.58	59	SG recorder inoperative.
1975	12	25	21	1975	12	26	12	1	.02	.04	.06	.12	.44	.82	.86	1	1975	12	26	04	15	2.34	25	
1976	01	04	09	1976	01	04	19	1	.02	.06	.10	.17	.29	.56	.56	1	1976	01	04	12	40	2.14	21	
1976	02	26	00	1976	02	28	19	1	.04	.09	.16	.27	.77	1.38	1.92	2	1976	02	27	10	10	3.61	60	
1976	03	13	07	1976	03	13	24	1	.02	.05	.08	.14	.50	.80	.80	1	1976	03	13	14	25	2.15	21	
1976	03	22	02	1976	03	24	24	1	.03	.04	.05	.09	.35	.81	1.28	2	1976	03	24	06	00	1.83	15	
1976	05	01	17	1976	05	01	24	1	.34	.67	.70	.70	1.00	1.00	1.00	--	1976	05	01	No data		3.36	53	SG recorder inoperative. Hail-storm occurred.
1976	06	30	13	1976	06	30	24	1	.06	.12	.18	.22	.39	.39	.39	1	1976	06	30	16	20	1.84	15	
1976	08	14	09	1976	08	16	24	1	.14	.21	.26	.30	.54	1.24	1.77	3	1976	08	16	19	35	2.21	22	
1976	12	25	05	1976	12	26	24	1	.03	.05	.07	.08	.32	.52	.92	2	1976	12	26	16	55	1.95	17	
1977	03	07	12	1977	03	09	12	1	.06	.13	.15	.19	.38	.45	.78	2	1977	03	08	20	30	2.20	22	
1977	05	01	20	1977	05	02	17	1	.14	.15	.17	.19	.66	1.25	1.25	2	1977	05	02	00	20	2.12	20	
1977	08	23	10	1977	08	24	12	1	.05	.11	.15	.23	.83	1.89	1.92	1	1977	08	25	20	40	2.19	22	
1977	11	24	08	1977	11	25	24	1	.04	.10	.15	.22	.80	1.32	1.76	1	1977	11	25	13	30	2.89	40	
1977	12	02	00	1977	12	03	24	1	.03	.06	.12	.19	.98	1.39	1.62	1	1977	12	02	13	15	3.17	48	
1977	12	12	12	1977	12	16	24	1	.04	.09	.16	.27	1.12	2.60	4.57	3	1977	12	13	11	55	5.27	106	

